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(54) Radio information terminal capable of facilitating on-line operation by a portable computer

(57) A radio information terminal comprises a radio unit, functioning as a proxy server to a portable computer when it is connected to the portable computer and unable to receive a control radio wave from a base station, and synchronizing information received from the portable computer with information of an original server via the base station when it comes to receive the control radio wave from the base station.

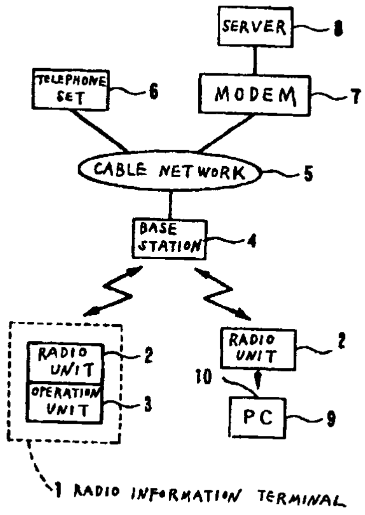

FIG 1

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Description

Background of the Invention:

[0001] The present invention relates to a radio information terminal connectable to a portable personal computer.

[0002] Portable telephones are used largely and vocal communication is now available anytime everywhere. On the other hand, the portable computer (PC) is made thinner, lighter and easier to carry, increasing the demand of on-lined operation everywhere using the radio communication line. To meet such demand, radio information terminals are commercialized, to function as modem for performing the radio data communication, when it is connected to a PC through a general use interface such as PCMCIA, and to function as portable telephone, when it is disconnected from the PC.

[0003] Now, the PC is a man-operated terminal requiring a certain ergonomically determined volume and the place for on-lined operation is restricted, in general, to the inside of a building or the like. On the other hand, as radio wave hardly reaches into the building, it is difficult to achieve real time communication with the radio information terminal, as assured by a cable modem.

Summary of the Invention:

[0004] It is therefore an object of the present invention to facilitate on-line operation by a portable computer.

[0005] Other objects of the present invention will become clear as the description proceeds.

[0006] According to an aspect of the present invention, there is provided an improved radio information terminal comprising: a radio unit (2), when connected to a portable computer (9), functioning as a proxy server to the portable computer (9) under the condition to be unable to receive a control radio wave from a base station (4) and synchronizing primary information received from the portable computer (9) with secondary information of an original server (8) via the base station (4) under the condition to be able to receive the control radio wave from the base station (4).

[0007] The portable computer (9) or an operation unit (3) may be connected to the radio unit (2), the radio unit (2) may function as a portable telephone when the operation unit (3) is connected thereto.

[0008] The radio unit (2) may be supplied with power from the portable computer (9) when the portable computer (9) is connected thereto, and be supplied with power from the operation unit (3) when the operation unit (3) is connected thereto.

Brief Description of the Drawings:

[0009]

Fig.1 is a system composition diagram of a communication system to which a radio information terminal of a preferred embodiment of the present invention is applied;

Fig. 2 is a block diagram for showing the functional composition of the radio unit in the preferred embodiment of the present invention; and

Fig. 3 is a block diagram for showing the functional composition of the operation unit in the preferred embodiment of the present invention.

Detailed Description of the Preferred Embodiment:

[0010] Now, referring to Figs. 1 through 3, description will proceed to a radio information terminal according to a preferred embodiment of the present invention.

[0011] Fig. 1 is a system composition diagram of a communication system to which a radio information terminal 1 of the present embodiment is applied. As shown in this diagram, this radio information terminal 1 comprises a radio unit 2 and an operation unit 3 and is composed to allow to use these radio unit 2 and operation unit 3 separated also. The radio information terminal 1 in a state where the radio unit 2 and the operation unit 3 are combined, communicates by radio with a base station 4, communicates by voice with a telephone set via a cable network 5 to which the base station is connected, and moreover, performs the data communication with the original server 8 connected to the cable network 5 via a MODEM 7, through the base station 4 and the cable network 5 also.

[0012] On the other hand, the radio unit 2 detached from the operation unit 3, is composed to allow the connection to a PCMCI slot 10 of a PC 9 (portable personal computer). The PC 9 has a function to perform the data communication with the original server 8 via the radio unit 2, base station 4, cable network 5 and MODEM 7, and also has a function to communicate only with the radio unit 2 without radio communication.

[0013] Fig. 2 is a block diagram showing the functional composition of the radio unit 2. As shown in this diagram, the radio unit 2 comprises an antenna 20 for radio wave transmission/reception between the base station 4, a radio circuit 21 connected to the antenna, a CPU 22 for controlling the control of the radio circuit 21 the communication with the externally connected PC 9, a memory 23 for string a control program to be executed by the CPU 22 or the like, a MODEM 24 for securing the data transmission reliability including the retransmission control or the others in opposition to a general use MODEM, a changeover switch 25 to be controlled by the CPU 22 and an input/output terminal 26 taking interface with the external devices.

[0014] Here, the radio unit 2 is composed to function as proxy server based on the control program, when it comes to a state unable receive control radio wave transmitted from the base station 4. In other words, the radio unit 2 functions as client to the original server 8, and as proxy server to the PC 9, the memory 23 storing information equivalent to the original server 8.

[0015] Besides, a supply circuit 27 of the radio unit 2 is supplied with power from the PC 9 when it is detached from the operation unit 3 and joins with the PC 9, and from the operation unit 3 when combined with the operation unit 3, and at the same time, in the case when it stands alone, the data stored in the memory is held by a supply backup means not shown.

[0016] Now, Fig. 3 is a block diagram the functional composition of the operation unit 3. The operation unit 3 comprises a operation key 31 for inputting the dial number or other operations, a display unit 32 for displaying the same dial number or radio state, a timer 33 for clocking the absolute hour or interval, an input/output terminal 34 to be joint to the input/output terminal 26 of the radio unit 2, an input/output port 35 controlled by a CPU 30, a microphone 36 to input voice, a receiver 37 to output voice, a CODEC 38 to convert voice analog signal into digital signal, a changeover switch 39 controlled by the CPU 30, a battery 40 to supply the respective units with power, and others.

[0017] Next, the operation of thus composed radio information terminal 1 will be described in detail.

[0018] First of all, the case wherein this radio information terminal 1 is used as portable telephone will be described. In this case, the radio unit 2 and the operation unit 3 are combined, through junction of the input/output terminal 26 of the radio unit 2 and the input/output terminal 34 of the operation unit 3. On the other hand, the supply circuit 27 of the radio unit 2 is supplied with power from the battery 40 via the input/output terminals 26, 34.

[0019] In this state, the telephone number of the destination telephone set input from the operation key 31 of the operation unit 3 is seized into the CPU 30 to be indicated on the display unit 32. After having confirmed this telephone number, when the user of this radio information terminal pushes down the off-hook button among the operation keys 31, and upon the detection of the same, the CPU 30 operated the input/output terminal 35 to write the telephone number and, at the same time, the communication connection demand into the memory 23 of the radio unit 2 from the input/output terminal 34 via the input/output terminal 26.

[0020] Then, upon the detection of the writing of the communication connection demand into the memory 23, the CPU 22 of the radio unit 2 demands the base station 4 the communication with the telephone number written in the memory 23 by controlling a radio apparatus 21, calls and connects a corresponding telephone set 6 via the cable network 5. Moreover, the CPU 22 of the radio unit 2 directly connects a serial signal terminal of the input/output terminal 26 and a input/output signal line of the radio circuit 21, by controlling the switch 25 according to the response signal announced by the base station 4 based on the response of the telephone set 6.

[0021] At the same time, the CPU 22 writes the response signal into the memory 23. Upon its detection through the input/output terminal 35, the CPU 30 of the operation unit 3 controls the switch 39 to connect the serial signal terminal of the input/output terminal 34 and the CODEC 38. As the result, the voice communication starts, because a microphone 36 and a receiver 37 are connected, to the CODEC 38. By the way, when a communication it to be terminated or when a call is received, and in other cases, a control signal is sent/received via the memory 23 of the radio unit 2, and the communication channel is controlled through the cooperation of the CPU 22 and the CPU 30 as mentioned above.

[0022] Next, a case where the radio unit 2 is connected to a PC 9 and communicated with the PC 9 will be described. In this case, as the radio unit 2 is connected to the PC 9 being indoors, or the like, this is the case where the radio unit 2 can not receive the control radio wave emitted periodically by the base station 4; consequently, the communication with the base station is in disabled state.

[0023] In such state, the radio unit 2 is disconnected from the operation unit 3, and the input/output terminal 26 is connected to a PCMCIA slot 10 of the PC 9. Then, the PC 9, demands thus connected radio unit 2, to connect to the original server 8 using a special telephone number (for instance, 999) set in the radio unit 2 beforehand, and the CPU 22 of the radio unit 2, judges that it-self should operate as proxy server from the special telephone number.

[0024] Thereafter, the radio unit 2 processes PPP (Point To Point), TCP/IP or other protocols forming a link in the position of a proxy server having the PC 9 as client. For example, if the PC 9 demands a mail readout by POP protocol, the radio unit 2 reads out mail information stored in the memory 23 and hands it to the PC 9. This mail information has been acquired through the communication with the original server 8, when the radio unit 2 was able to communicate with the base station 4 as mentioned below, and stored in the memory 23.

[0025] Further, when the radio unit 2 and the operation unit 3 are separated, the radio unit 2 is supplied with power form the PCMCIA slot 10 of the externally connected PC 9. Moreover, the content of the memory 23 is maintained even when the radio unit is not supplied with power, by using a nonvolatile memory, or by employing a backup battery.

[0026] Successively, a case where a radio information terminal 1 wherein the radio unit 2 and the operation unit 3 are combined performs data communication with an original server 8 will be described. In this case, this is the case where the radio unit 2 is used as a part of the radio information terminal 1, and is often submitted for the outdoor use. In a state combined with the operation unit 3, when the radio unit 2 receives the control signal emitted periodically by the base station 4, it transmits as a client to the original server 8 the information stored in the memory 23 during its operation as the proxy server.

[0027] Further, the call time, the original server 8 telephone number, or others are supposed to be written into (from) the memory 23 of the radio unit 2 beforehand by the PC 9. On the other hand, in the radio unit 2, the CPU 22 is supposed writing periodically into the memory 22 the state of control signal from the base station 4 received permanently by the radio circuit 21.

[0028] In this case, if the call time written the memory of the radio unit 2 agrees with the time read out from the timer, the CPU 30 of the operation unit 3 will read out the control radio wave state written also in the memory 23 and determine if the communication is enabled or not, seize the telephone number of the original server 8 written also in the memory 23 and write the telephone number with the data communication connection demand into the memory 23 of the radio unit 2 through the input/output terminal 34, 26 by controlling the input/output port 35.

[0029] Upon the detection of the data communication connection demand written into the memory 23, the CPU 22 of the radio unit 2 will demand the base station 4 the data communication with the telephone number written in the memory 23 by controlling the radio circuit 21, call up and connect to the MODEM 7 linked to a corresponding original server 8 via a cable network 5.

[0030] Thereupon, the CPU 22 of the radio unit 2 will control the switch 25 based on the response signal announced by the base station 4 for the response of the MODEM 7, connects between the serial signal terminal of the input/output terminal 26 and the input/output signal line of the radio apparatus 21 via the MODEM 24 and, at the same time, write the response signal into the memory 23.

[0031] Upon its detection via input/output port 35, the CPU 30 of the operation unit 3 controls the switch 39 to directly connect the serial signal terminal of the input/output terminal 34 and the CPU 30. Thereupon, the CPU 30 starts to communicate with the original server 8, reads out mails using a protocol such as POP and writes into the memory 23 through the input/output port 35.

[0032] When the CPU 30 finishes to seize all unread mails stored in the original server 8, it directs the CPU 22 to disconnect the line through the memory 23 of the radio unit 23. Then, it displays that it has seized mails on the display unit 32. Further, the CPU 30 reads out once seized mails from the memory 23 of the radio unit 2 on the display unit 23 or deletes them.

[0033] At last, a case wherein the radio unit 2 is used for the direct data communication between the PC 9 and the original server 8 will be described. This case concerns a usage mode enabled when the radio unit 2 is connected to the PC 9 in a state such as outdoors or the like where it can receive the control radio wave of the base station 4. In this case, the radio unit 2, detached from the operation unit 3 is connected to the PCMCIA slot of the PC 9. There, the PC 9 operates taking the radio unit 2 as a general use MODEM.

[0034] In this state, the CPU 22 of the radio unit 2 connects between the serial signal terminal of the input/output terminal 26 and the input/output signal line of the radio apparatus 21 via the MODEM 24, by controlling the switch 25. Then, the CPU 22 obtains information required for the communication control such as connection demand or connection destination telephone number from the PC 9 via the MODEM 24. The PC 9 writes the connection demand including the telephone number of the MODEM 7 connected to the original server 8 into the memory 23 of the radio unit 2.

[0035] When the CPU 22 detects that the communication connection demand is written in the memory 23, it controls the radio unit 2 to demand the base station 4 the communication with the telephone number written in the memory 23, calls up and connects a corresponding MODEM 7 via the cable network 5. Then, the CPU 22 connects the MODEM 24 between the serial signal terminal of the input/output terminal 26 and the input/output signal line of the radio circuit 21 by controlling the switch 25, for the response signal announced by the base station 4 according to the response of the MODEM 7. Thereafter, the PC 9 starts to communicate with the original server 8 via the MODEM 7 of the communication interlocutor.

[0036] According to this embodiment, the radio unit 2 functions as proxy server to the PC 9, out of the radio wave reach, and communicates with the original server 8 as MODEM within the radio wave range. On the other hand, in a state wherein the radio unit 2 is disconnected from the PC 9 and combined with the operation unit 3, as it presents such size and use equivalent to a portable telephone, it will synchronize data automatically with the original server 8, when it is set in a place where the radio wave conditions are appropriate for the communication as its holder carries it around.

[0037] Therefore, as the radio unit 2 always obtain the latest information form the original server 8, it can supply the PC 9 with this latest information, when is functions as proxy server. Moreover, concerning the communication protocol, as communication protocols similar to those for the communication between the original server 8 and the PC 9 can be used, it is not necessary to modify especially on the PC 9 side.

[0038] As described above, according to the radio information terminal according to the preferred embodiment of the present invention, the following effects can be expected.

[0039] First, comprising a radio unit, functioning as proxy server to a portable computer when it is connected to the portable computer and unable to receive the control radio wave from a base station, and synchronizing the information received from the portable computer with the information of a original server via the base station when it comes to receive the control radio wave of the base station, the portable computer information stored when it was functioning as proxy server is synchronized with the original server when it comes to receive the control radio wave of the base station. Therefore, even a portable computer which may be used in an environment, such as indoors or the like, where the control radio wave of the base station can not be received, can perform a false on-line operation.

[0040] Second, as a portable computer or an operation unit can connected, and the radio unit is so composed to function as portable telephone when the operation unit is connected, it can also be used as portable telephone.

[0041] Third, as the radio section is supplied with power from the portable computer when the portable computer is connected, and is supplied with power from the operation unit when the operation unit is connected, a memory backup battery or an equivalent may well be provided for maintaining the information, allowing to downsize the equipment composition and improve its portability.

Claims

1. A radio information terminal comprising:

   a radio unit (2), when connected to a portable computer (9), functioning as a proxy server to said portable computer (9) under the condition to be unable to receive a control radio wave from a base station (4) and synchronizing primary information received from said portable computer (9) with secondary information of an original server (8) via said base station (4) under the condition to be able to receive said control radio wave from said base station (4).

2. The radio information terminal as claimed in claim 1,
   said portable computer (9) or an operation unit (3) being connected to said radio unit (2), wherein said radio unit (2) functions as a portable telephone when said operation unit (3) is connected thereto.

3. The radio information terminal as claimed in claim 2,
   wherein said radio unit (2) is supplied with power from said portable computer (9) when said portable computer (9) is connected thereto, and is supplied with power from said operation unit (3) when said operation unit (3) is connected thereto.

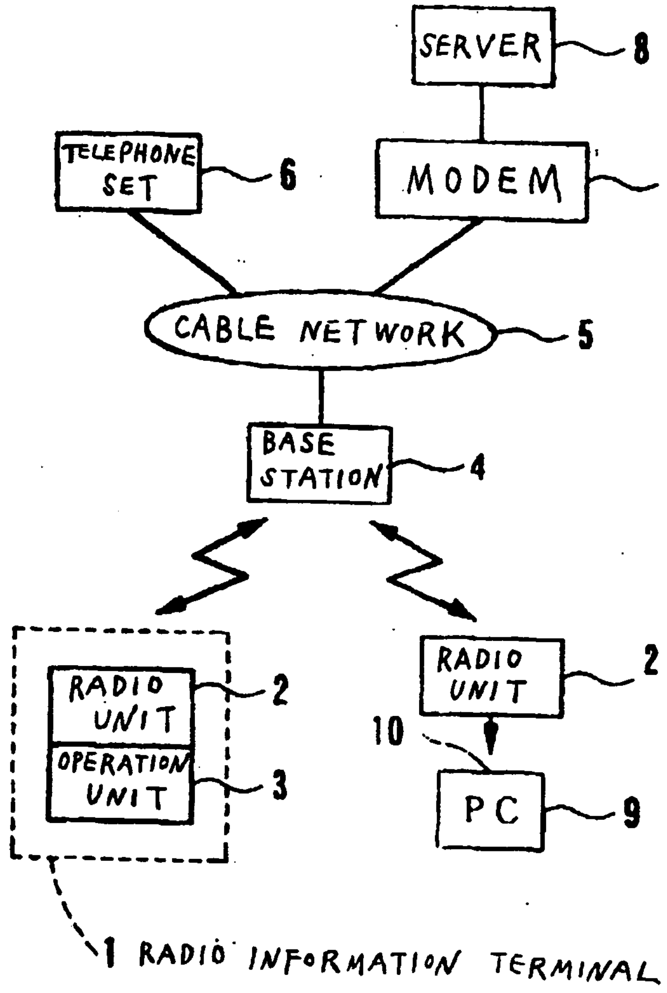
SERVER
8
TELEPHONE SET
6
MODEM
7
CABLE NETWORK
5
BASE STATION
4
RADIO UNIT
2
OPERATION UNIT
3
RADIO UNIT
2
10
PC
9
1 RADIO INFORMATION TERMINAL

FIG 1

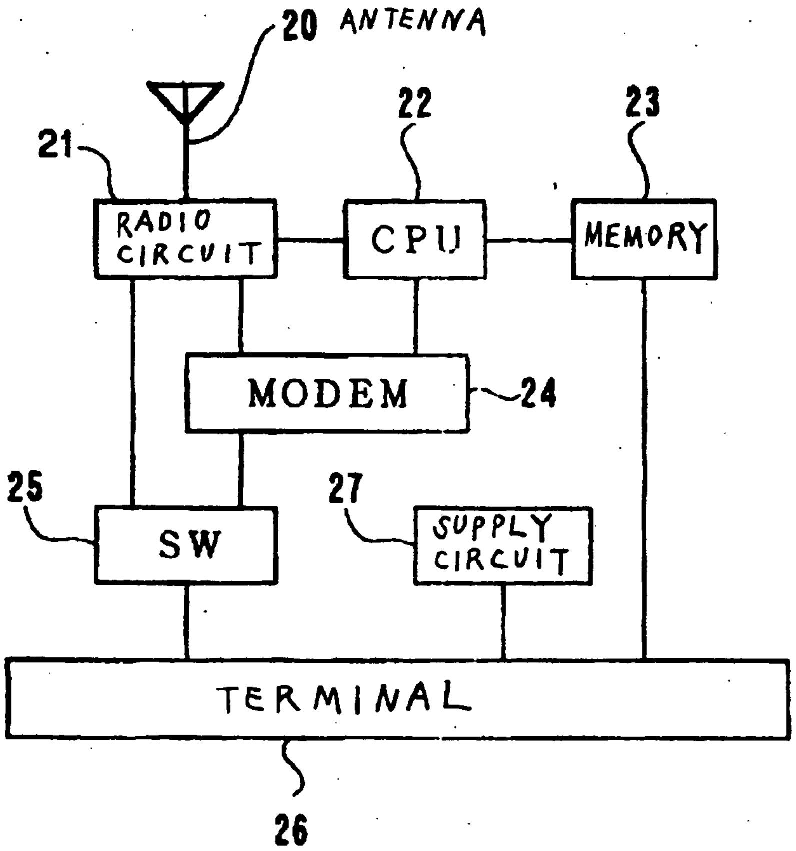
20 ANTENNA
21
RADIO CIRCUIT
22
CPU
23
MEMORY
MODEM
24
25
SW
27
SUPPLY CIRCUIT
TERMINAL
26

FIG 2

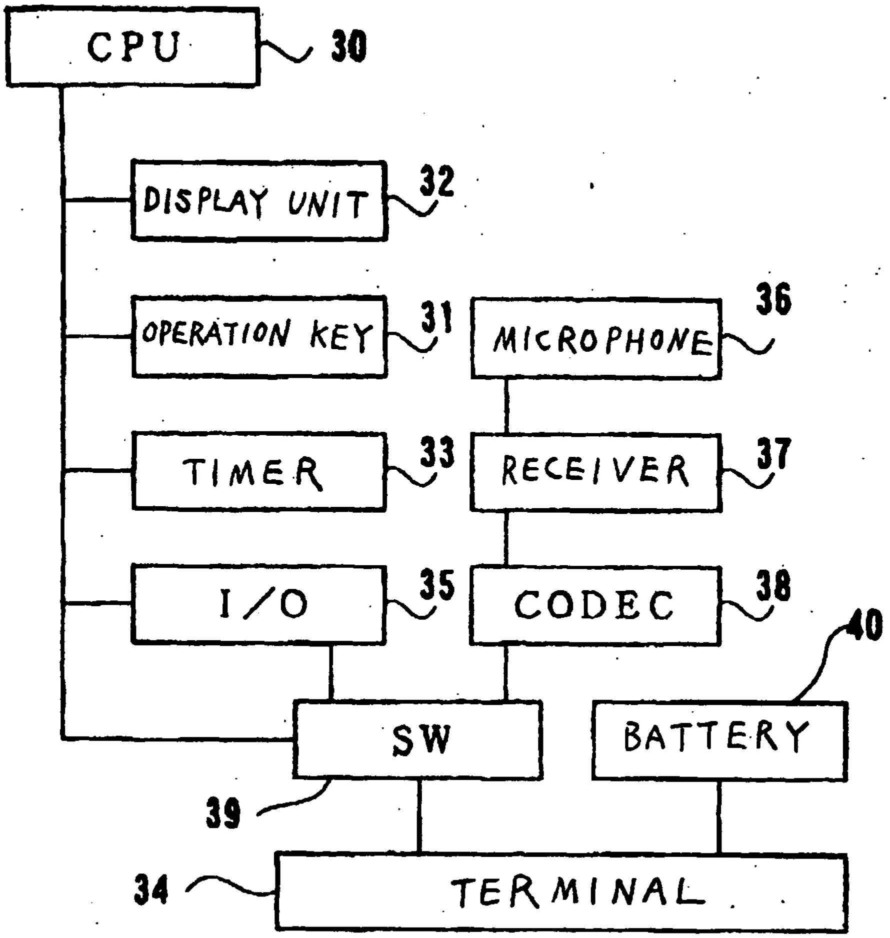
CPU
30
DISPLAY UNIT
32
OPERATION KEY
31
MICROPHONE
36
TIMER
33
RECEIVER
37
I/O
35
CODEC
38
40
SW
BATTERY
39
34
TERMINAL

FIG 3